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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
WOZNIAK, JAMES S	

ART UNIT	PAPER NUMBER
2655	6

DATE MAILED: 07/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/778,675	MACAUSLAN ET AL.	
	Examiner	Art Unit	
	James S. Wozniak	2655	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/07/2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 February 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

Claim Objections

1. **Claim 4** is objected to because of the following informalities: "process" on Line 5, should be corrected to read --processed--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al *("Application of Noise Reduction Techniques for Alaryngeal Speech Enhancement," 1997)* in view of Holzrichter et al *(U.S. Patent: 5,729,694)*.

With respect to **Claim 1**, Cole discloses:

A method for processing an acoustic signal to separate the acoustic signal into a voiced (V) component corresponding to an electrolaryngeal source *(speech produced using an artificial larynx, Abstract)* and an unvoiced (U) component corresponding to a turbulence source, the method comprising the steps of:

Determining the U component by subtracting the V component sample stream from the original stream of numerical values *(electro-laryngeal speech enhancement method capable of detecting and removing noise through spectral subtraction, Page 492, Section 3, Paragraph 1)*.

Cole does not specifically teach the steps, well known in the art, of processing a speech signal through digitization and Fourier transform techniques prior to identifying and removing noise, however Holzrichter discloses:

Digitizing the acoustic signal to produce an original stream of numerical values *(Col. 14, Lines 21-23)*;

Extracting a segment of consecutive values from the original stream of numerical values to produce a first group of values covering two or more periods of a speech source *(extraction of feature vectors from selected time frames, Col. 4, Lines 21-23)*;

Performing a discrete Fourier transform on the first group of values to produce a discrete Fourier transform result *(obtaining a Fourier transform, Col. 33, Lines 54-57)*;

Extracting a second group of values from components of the discrete Fourier transform result which correspond to an electrolaryngeal *(electrolaryngeal speech input as recited by Cole above)* fixed repetition rate, FO, and harmonics thereof *(extraction of speech features corresponding to the fundamental frequency and its associated harmonics, Col. 34, Lines 3-12. Also, speech input can be from an electrolaryngeal source as seen in Fig. 3A)*;

Inverse Fourier transforming the second group of values, to produce a representation of a segment of the V component *(inverse processing of the above coding method that would inherently include a inverse Fourier transform step in synthesizing speech, Col. 32, Lines 28-33)*;

Concatenating multiple V component segments to form a V component sample stream *(concatenating speech frames in speech processing for synthesis, Col. 60, Lines 53-60)*;

Cole and Holzrichter are analogous art because they are from a similar field of endeavor in speech processing applicable to electrolaryngeal speech. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to combine the method of processing an acoustic signal through digitization and Fourier transform techniques as taught by Holzrichter with the method of electrolaryngeal speech enhancement featuring spectral subtraction to detect and remove a noise segment as taught by Cole since the processing method taught by Holzrichter can be used with any acoustic speech input (Abstract), which would include that from an electrolaryngeal and to provide the well-known acoustic processing necessary to detect and remove noise in the method of electrolaryngeal speech enhancement taught by Cole. Therefore, it would have been obvious to combine Holzrichter with Cole for the benefit of obtaining the necessary acoustic processing to be applied to a spectral subtraction method for improving the quality of electrolaryngeal speech, to obtain the invention as specified in Claim 1.

With respect to **Claim 2**, Cole further recites:

Determining segments of the input acoustic signal that correspond to inter-word segments *(detection of silence periods between utterances (noise and electrolaryngeal excitations), Page 492, Section 3, Paragraph 3)*.

With respect to **Claim 3**, Cole further discloses:

The step of determining inter-word segments includes a step of determining total power in the segments and characterizing such segments with relatively low power as inter-word segments *(obtaining a normalized autocorrelation over a pitch range and comparing it to a*

threshold to determine the presence of silence between words (electrolaryngeal excitation), Page 492, Section 3, Paragraph 3).

With respect to **Claim 5**, Cole teaches the method of electrolaryngeal speech enhancement featuring spectral subtraction to detect and remove a noise segment. Cole does not teach method use in a digital signal processor connected in line with a telephone apparatus, however Holzrichter recites:

The steps are performed in a digital signal processor connected in line with a telephone apparatus *(Col. 16, Lines 51-55, and Fig. 20).*

Cole and Holzrichter are analogous art because they are from a similar field of endeavor in speech processing applicable to electrolaryngeal speech. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to combine a digital signal processor connected to a telephone apparatus as taught by Holzrichter with the method of electrolaryngeal speech enhancement featuring spectral subtraction to detect and remove a noise segment, in order to provide further method compatibility and implement an input means for the device, necessary to receive an electrolaryngeal speech input. Therefore, it would have been obvious to combine Holzrichter with Cole for the benefit of obtaining a means of receiving an electrolaryngeal speech input to be enhanced, to obtain the invention as specified in Claim 5.

With respect to **Claim 6**, Cole suggests:

A method for processing an acoustic signal to separate the acoustic signal into inter-word and non-inter-word segments, the method comprising the steps of:

Determining an average power level for the group of values *(obtaining a normalized autocorrelation over a pitch range, Page 492, Section 3, Paragraph 3)*; and

If the average power level of the group of values is below a threshold value, determining that the group of values corresponds to an inter-word segment of the acoustic signal *(obtaining a normalized autocorrelation over a pitch range and comparing it to a threshold to determine the presence of silence between words (electrolaryngeal excitation), Page 492, Section 3, Paragraph 3)*.

Cole does not specifically teach the steps, well known in the art, of processing a speech signal through digitization and Fourier transform techniques prior to identifying and removing inter-word noise, however Holzrichter discloses:

Digitizing the acoustic signal to produce an original stream of numerical values *(Col. 14, Lines 21-23)*;

Extracting a segment of consecutive values from the original stream of numerical values to produce a group of values *(extraction of feature vectors from selected time frames, Col. 4, Lines 21-23)*;

Cole and Holzrichter are analogous art because they are from a similar field of endeavor in speech processing applicable to electrolaryngeal speech. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to combine the method of processing an acoustic signal through digitization and Fourier transform techniques as taught by Holzrichter with the method of electrolaryngeal speech enhancement featuring the detection of a noise segment as taught by Cole since the processing method taught by Holzrichter can be used with any acoustic speech input (Abstract), which would include that from an electrolaryngeal and to provide the well-known acoustic processing necessary to detect and remove noise in the method of electrolaryngeal speech enhancement taught by Cole. Therefore, it would have been obvious

to combine Holzrichter with Cole for the benefit of obtaining the necessary acoustic processing to be applied to a spectral subtraction method for improving the quality of electrolaryngeal speech, to obtain the invention as specified in Claim 6.

With respect to **Claim 7**, Cole teaches exceeding a higher threshold to indicate the presence of speech *(Page 492, Section 3, Paragraph 3)*. Cole also teaches that a value greater than a threshold would correspond to a non-inter-word segment (speech).

With respect to **Claim 8**, Cole additionally discloses:

Setting the group of values to a zero value if they correspond to an inter word segment *(detection of noise between words and noise removal through spectral subtraction, which eliminates the presence of the noise to enhance electrolaryngeal speech, Page 492, Section 3)*.

4. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al in view of Holzrichter et al, and in further view of Hardwick et al *(U.S. Patent: 5,216,747)*.

With respect to **Claim 4**, Cole in view of Holzrichter discloses the method of electrolaryngeal speech enhancement featuring necessary audio processing techniques prior to spectral subtraction of noise. In addition, Cole further suggests:

For segments determined to be inter-word segments, setting the corresponding values of the V component sample stream to a zero value *(detection of noise between words and noise removal through spectral subtraction, which eliminates the presence of the noise to enhance electrolaryngeal speech, Page 492, Section 3)*;

Cole and Holzrichter do not teach adding voiced and unvoiced component values in order to produce a complete acoustic sample stream, however Hardwick recites:

Adding the U component values to the altered V component sample stream values *(processing an unvoiced portion of speech separately and adding it to a voiced portion, Col. 6, Lines 65-67)*; and

Producing a process acoustic sample stream from the addition of the U values and altered V values *(producing a complete synthesized speech signal through the addition of voiced and unvoiced components, Col. 6, Lines 65-68)*.

Cole, Holzrichter, and Hardwick are analogous art because they are from a similar field of endeavor the processing of voiced and unvoiced speech. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to combine the method of adding a voiced and unvoiced component to produce a complete speech signal as taught by Hardwick with the method of electrolaryngeal speech enhancement featuring necessary audio processing techniques prior to spectral subtraction of noise as taught by Cole in view of Holzrichter to provide the necessary post-processing in order to reconstruct a complete enhanced electrolaryngeal speech signal, from which noise has been cancelled in order to eliminate inter-word "buzz." Also, it would have been obvious to one of ordinary skill in the art, at the time of invention, to filter the voiced components of a speech signal in order to eliminate high or low frequency signals that would prove inaudible and thus, in the process, simplify speech signal processing. Therefore, it would have been obvious to combine Hardwick with Cole in view of Holzrichter for the benefit of obtaining a complete enhanced electrolaryngeal speech signal through the addition of voiced and unvoiced components, to obtain the invention as specified in Claim 4.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Javkin et al *(U.S. Patent: 5,890,111)*- teaches a method of alarygneal speech enhancement that eliminates detected inter-word noise by setting the signal gain to zero.
- Espy-Wilson *(U.S. Patent: 6,359,988)*- teaches a method of electrolaryngeal speech enhancement through the elimination of background noise and pitch variation.
- Espy-Wilson et al *("Enhancement of Alaryngeal Speech by Adaptive Filtering," 1996)*- discloses a method of electrolaryngeal speech enhancement that eliminates noise generated from a alarygneal device when the speaker's mouth is closed during words, detected through comparison of an average energy to a threshold.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James S. Wozniak whose telephone number is (703) 305-8669 and email is James.Wozniak@uspto.gov. The examiner can normally be reached on Mondays-Fridays, 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Talivaldis Ivars Smits can be reached at (703) 306-3011. The fax/phone number for the Technology Center 2600 where this application is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology center receptionist whose telephone number is (703) 306-0377.

James S. Wozniak
3/15/2004

TĀLIVALDIS IVARS ŠMITS
PRIMARY EXAMINER